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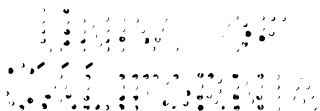


ROBERT S. DENHAM
Chief Engineer
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The A-B-C *of* Cost Engineering

By
ROBERT S. DENHAM

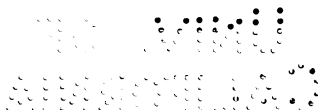
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FOREWORD

The author's object is to make it possible for the busy executives of American manufacturing enterprises to grasp in minimum time, at least in outline, the principles and advantages of the newest and most practicable methods of determining the cost of producing and selling the products of their factories.

It is an unfortunate fact that at the present time a great majority of manufacturers, following traditional practices, are confidently leaning upon cost accounting methods which delude them into the belief that they are more successful than is actually the case. Not infrequently it is made to appear that their businesses are being profitably conducted when as a matter of fact they are losing money.

It is a demonstrable fact that, once financed and established, a factory can be

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operated at a loss of ten per cent of its capital per year, and remain in active operation for fifteen years. During much of this time its directors may authorize and pay dividends, and according to common erroneous accounting practices, it may seem to be reasonably successful. Frequently these conditions exist without even a suspicion on the part of the managing executive, much less his knowledge.

The fact that in normal pre-war times the life of the average manufacturing concern was less than fifteen years, proves conclusively that there was, and is, something radically wrong with the business methods in common use.

Such conditions warrant the plainest language on the part of the author, and his statements deserve the most thoughtful consideration and investigation on the part of the reader, particularly if he is the managing executive of a factory.

Every statement proffered, no matter how exaggerated it may appear on its face,

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is subject for proof. Each of the facts presented represents a phase of the concrete results of many years of investigation and practice on the part of an organization of capable Cost Engineers whose experience covers the planning, installation and operation of Cost Engineering systems in approximately seven hundred factories.

The executive who, because he has been successful, or having studied the works of so-called authorities on cost accounting believes himself fully informed, dismisses the subject of Cost Engineering without careful thought, may thereby forfeit his opportunity to greatly increase the profitability of his efforts.

Cost Engineering makes it possible to increase profits, not so much by advancing prices as by revealing the weak points in the making and selling effort, so that special attention may be given to strengthening them, thereby decreasing existent unseen losses which absorb part or all of the normal profits.

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The author hopes that the executive who reads this book will derive both pleasure and profit from its perusal, whether or not he avails himself of the services of this company.

Respectfully submitted,

THE DENHAM COSTFINDING COMPANY

By Robert S. Denham, *Chief Engineer*

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*"Some ships sail East, and some sail West,
In the selfsame winds that blow;
'Tis the set of the sails, and not the gales,
That takes them where they go."*
—Selected.

CHAPTER I

THE MYSTERIES OF COST

Mystery is always coexistent with ignorance.

Nothing is mysterious to those who know the truth.

There are no mysteries in cost to those who know the principles of Cost Engineering, and how to apply them.

Cost of production is a mystery to most manufacturers because they either do not know how to correctly determine the cost, or have not applied their knowledge.

The most unfortunate condition confronting American industries to-day is the almost universal prevalence of erroneous teachings in regard to methods of determining cost.

The great mystery of business is the so-called "Overhead Expense" or "Burden" of cost accounting.

Thousands of pages have been written on the subject of "Distributing the Overhead Burden;" thousands of men have spent valuable time in vain efforts to apply the formulas presented, yet in the minds of the great majority of both manufacturers and accountants, *cost*, the point where expense ends and profit begins in manufacture, is as great a mystery as ever.

In discussion, with patrons or competitors, practically every manufacturer expresses confidence in his knowledge of cost of production in his own business. Some are confident that they know. Others, pretending only, persistently proclaim knowledge until they forget that their assertion was originally pretense. A few, more candid than the rest, admit that they are ignorant of cost and base their selling prices upon estimates, or on their personal opinion of what the traffic will bear.

Why all this wasted effort, confusion of thought, and uncertainty of result?

Simply because traditional cost accounting depends upon the opinions of persons to whom the fundamental principles of expense and expense distribution are unknown. In the absence of knowledge of such principles every man tried out his own theory according to his opportunity.

The real difficulty antedates machine production.

There was a time when all work was done by hand. Factories were small, often in a room of the employer's house, sometimes in his cellar, or in the attic of his barn. Expenses were few. Practically all that he required, besides the shelter, was a few crude benches and sufficient capital to provide materials and pay for his helpers. The workmen usually preferred to own the tools

with which they worked and keep them in condition.

The manufacturer made no serious effort to determine cost beyond the computation of the outlay for materials and direct wages on designated lots. To the total of these he added a percentage large enough to cover his living expenses and a margin of profit. His customers paid the prices he asked, or went without the goods. There was often no competition. If any existed, it was local, because there were no such transportation facilities as have since been developed. There were no traveling salesmen.

With the advent of machine production conditions changed. The employer was compelled to provide the equipment. He faced the necessity for a larger investment, and added expenses for power, supplies and repairs.

With the application of power came the railroad, and the advan-

tages that it offered for a larger field of action. His horizon was enlarged, facilities were rapidly increased, and these in turn developed greater problems.

His old price-making formulas were outgrown, and required modification to meet the new conditions. In his calculation he now recognized a new factor, for want of a better term he called it "overhead expense." The cost of his product consisted of three factors: materials, wages, and overhead. To the total of these he added a margin for profit.

Sometimes he included in the "overhead" a salary for himself, often he took the position that he got his living from the profits. Depreciation was rarely thought of, and more rarely included. Interest on investment as an item of expense was never dreamed of. It was taken for granted that a man in business should furnish the capital required to serve his cus-

tomers and carry their accounts without remuneration other than the profits. If he owned the building in which his factory was located he boasted that he had no rent to pay, and its use was provided without charge to his customers.

To this day many manufacturers believe that the inclusion of salary for the owner, rent of the owned building, depreciation and interest on the investment is optional with the concern. Many accountants, because of ignorance of fundamental principles, accept the manufacturer's viewpoint. Assuming that these are matters of opinion is responsible for the lack of uniformity and the endless discussions which befog the practice of cost accounting.

To questions such as these there can be but one correct answer. That answer is given in Cost Engineering. For the first time in the history of manufacture the principles of expense

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analysis and distribution have been formulated. They have been tried out in hundreds of factories. If a single instance had been found, or could be imagined, where these principles did not prove true there would be reason to believe that they were incorrectly formulated; but large experience has failed to find them misstated.

Cost accounting authorities are practically unanimous in their presentation of the traditional theory that the cost of production consists of the three elements: materials, direct wages, and "overhead." They agree as to charges for materials and direct wages, but indulge in endless and unconvincing discussions as to methods of distributing the "overhead."

The mystery still remains unsolved and so long as accountants create the "overhead" just so long will it remain unsolved.

The whole theory of "overhead expense" is wrong. There are no "overhead" expenses in manufacture. The "overhead" expense account is the cesspool of business. It is the catch-all for every item that the accountant *does not know* how to properly charge to the product. That "*does not know*" spells ignorance. The extent of the "overhead" account in a cost accounting system indicates the extent to which the accountant is ignorant of correct methods of expense distribution.

Mystery and ignorance are always coexistent. Learn the truth and mystery will disappear. There are no mysteries in cost to those who understand the principles of Cost Engineering and know how to apply them.

CHAPTER II

WHAT IS A COST SYSTEM?

What is a Cost System?

Every man engaged in manufacture is confident that he can answer this question intelligently, but aside from the irrelevant reply, "A Cost System is a system for finding the cost of production," it is not likely that two men out of a thousand would agree.

At the same time practically every one of these men would confidently express the opinion that if he had the necessary time, and set about it, he could plan and install a thoroughly accurate cost system.

Thousands of men have tried it, and failed. Accountants, employed specifically for this purpose, with ample time and facilities, during long periods, covering months and in many instances years, have failed.

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Both manufacturers and accountants gave their best effort, believed for a time that they had succeeded, yet learned finally that their creations were rendered ineffective as soon as radically altered conditions affected the business.

No two factories are alike. The conditions in each differ because of differences in personnel, management, methods of production and conditions of distribution. A system that seems practical for one factory will prove impractical in another which, to the casual observer, appears very similar.

There should be no uncertainty in a cost system.

Cost is always definite.

Two systems designed for the determination of cost, producing different results with the same factors, cannot both be right. One may be right and the other wrong, or both may be wrong.

Results must be provable.

According to the recognized authorities upon the subject of cost accounting, a cost system is an established clerical routine whereby records are kept and each order, or lot of product, charged directly with the materials required for its production, with the wages of the workers engaged directly in its production, and a share of the "overhead burden," which supposedly includes all of the other expenses involved in the operation of the factory.

In more than nine-tenths of the cost accounting systems in use, the "overhead" is distributed to the factory orders on the basis of direct wages. In a relatively small proportion the expenditures for materials and direct wages are combined to determine the so-called "prime cost" which is used as a basis for the distribution. In still fewer instances the overhead is averaged over estimated

productive hours of machines. In these cases the result is found by combining the expenditures for materials and direct wages with the predetermined machine hour rate for such hours as were required.

The three methods cited in the foregoing paragraph comprise practically the range of methods offered in the books on cost accounting. They are constantly referred to in the current literature of the accounting profession. Accountants engaged in establishing cost systems are advised to choose the method in their opinion most practicable for the case in hand.

In rare instances, as in the case of cement factories, or others making a single item measurable by a single unit, as the barrel, such a system might prove practicable. But in factories making product in any variety, or different sizes of the same article, these methods will be found grossly inaccurate. The greater the

variety the less likely are the results to be dependable.

If it could be shown that the expenses of operating the factory, aside from the direct wages, were involved in the various processes in the same proportion as the rates of wages paid, there would be some excuse for the theories advanced.

If it could be shown that the expenses of materials had any relation to the expenses involved in the processes, materials might be said to constitute a basis for the distribution of the overhead expenses.

Examination of the expenses of processing operations will reveal to the casual observer that there is not a single expense item which has any direct relation either to the wages paid or to the expenditure for materials used. There is not a single item of operating expense that increases proportionately with the increase of wages, or decreases with a decrease

in wages. Not one of the items of expense involved in the operation of manufacturing processes increases as the price of materials advances or decreases proportionately as the prices fall.

It is evident therefore that none of these methods can be depended upon as a means of determining the cost of production in a factory where there are many processes, applied to different kinds of materials, in the production of articles which differ in size or character.

To be practicable, the results of a cost system must be provable.

Personal opinions as to cost, or methods of determining cost, are worthless unless they can be proven correct.

Cost can be determined in a manner that will admit of absolute proof of every step in the process. The cost of each individual item, or lot, can be found, regardless of the variety of

items produced within a single factory, or the use of machines and processes interchangeably as required.

The practicable method will be explained in another chapter under the caption "Cost Engineering."

A practicable cost system is an established clerical routine through which records of factory activities and the expenses involved in the operation of the processes are so analyzed, classified and applied that every item of product will be charged with exactly the share of the particularized expenses that were required for its production, no more, and no less.

In a practicable cost system no expense can be considered as basic, and there can be no problem of "overhead distribution."

While detailed description of Cost Engineering methods will comprise a separate chapter, the author wishes here to impress the reader with these important truths:

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1. Any system that deserves the confidence of the user should be provable.

2. Any system the results of which are materially influenced by the personal opinion of its author or user is worthless.

3. *Any system which depends for results upon the distribution of an "overhead," "burden," or "general expense" account is erroneous and misleading.*

4. *Any system in which one or more expenses are assumed to constitute a basis for the distribution of other expenses will not stand the test of analysis.*

5. There is not a single expense, much less a mass of expenses, that increases proportionately as wages are advanced, or decreases as wages are reduced.

6. There is not a single operating expense that has any definite relation

to the cost of the materials of which the product is composed.

7. Neither direct labor, nor material, nor both combined, will serve as a basis for the distribution of any or all of the operating expenses.

8. The fact that all expenses have been considered and included in the cost is not an evidence that the cost of individual orders or items has been correctly determined.

9. Neither the fact that a certain method has been used for a long term of years, nor that during the period of its use the concern has enlarged and paid dividends, can be admitted as evidence that either the methods or the results are correct.

The day of haphazard and makeshift methods has passed. The manufacturer who wishes to stay in business must fix his prices upon provable facts, otherwise he is not deserving of the confidence of his customers or of the community.

Selling prices are fairest when they include not only a reasonable profit above cost of manufacture, but the elements of Efficiency of production and Management which assure the buyer that the cost has not been inflated through careless or extravagant business methods.

CHAPTER III

COST ENGINEERING

Cost Engineering is the science of costfinding by analysis of the processes and expenses of production, and the charging of particularized expense factors, through process unit rates, in the exact ratio of utilization.

The objects of Cost Engineering are five in number:

1. To determine by analysis the cost per unit of the various processes involved in the manufacture of product.

2. To determine in a provable manner the cost of each lot of product manufactured.

3. To determine the relative profitability of the several articles or lines comprising the range of product.

4. To show in analytical form the cost of each lot, that unprofitable items may be isolated and studied

with a view to changing methods of production, specifications, or prices, so that the sale of each will yield a fair profit.

5. To show the relative cost of different lots of the same article, for the purpose of revealing the most economical methods of production, as a means of efficiency and economy.

In Cost Engineering "*Cost*" is always considered as the sum or total of all expense elements involved in the production and distribution of the items on which cost is being considered up to the moment at which cost is being determined. The elements of cost are "expenses."

This is in striking contrast with cost accounting, in which such terms as "direct labor cost," "material cost," "prime cost," "actual cost," "factory cost," "gross cost," "net cost," etc., confuse and mystify to a degree that renders discussion almost if not quite unintelligible.

To be understood, the participants in a discussion must use a common terminology. In other words they must "speak the same language."

Cost accounting has never had a definite terminology. Its terms mean different things to different individuals. Practically no two accountants would give definitions of the important term "cost" which could be harmonized. Cost accounting starts with mystery and ends in mist.

Cost Engineering has a definite terminology.

Cost Engineering is governed by fundamental principles as definite and understandable as the principles of mathematics or physics.

The application of these principles and their concomitant rules to the factors of production develop results as definite, logical, and provable as the results of other mathematical calculations.

Definiteness is the keynote of Cost Engineering.

Every expense element is *definite*. It is *definite* in amount or it could not be recorded. It is *definite* in purpose or it would not be authorized. Its purpose is always the procurement of a *definite* service or commodity more advantageous than the amount of money involved, otherwise the exchange would not be made. The advantage gained by the expenditure imparts a *definite* degree of benefit wherever purchased item is utilized.

Correct distribution of an expense item demands that the charge shall always be made against the product benefited, and if more than one item or process be benefited the charges must be in the ratio of benefit or advantage conferred.

In manufacture, product always consists of *definite* materials, to which have been applied the time of *definite* formative processes.

Materials are measurable.

The expenses involved in the purchase, transportation, storage, and handling of materials can be *definitely* determined.

With *definite* specifications for materials, *definite* information as to expenses involved, there should be no question about the possibility of determining the cost of materials required for any given lot of product.

Processes are *definite*.

A capable engineer can in a short time make a complete list of the processes which any given factory is equipped to perform.

The expenses required for the operation of processes are *definite*.

The purposes for which the expenditures are made are *definite*.

Expenses always have one of two qualities: they are either direct or indirect.

Direct expenses are items having a single beneficiary, to which they are

chargeable in total. No act of distribution is required.

Indirect expenses are items having two or more beneficiaries to which they must be charged in the ratio of benefit conferred.

Indirect expenses may be grouped for simultaneous distribution only when the beneficiaries are identical, the ratio of benefit the same, and their benefits are measurable by a common unit. (Ignorance of this principle has been the most serious obstacle in the path of those who tried to solve the problem of "overhead distribution" in cost accounting. Having violated this principle practical distribution becomes impossible.)

None of the operating expenses have any relation to, or are involved in, the ratio of wages paid to workmen.

Practically every expense involved in the operation of manufacturing processes has a *definite* relation to the element of *time*.

Rent is paid on a *time* basis, or if the building is owned the items of depreciation and insurance on the building, and interest and taxes on the investment in building and land are calculated on a *time* basis.

As between the processing divisions of a factory the expenses of providing the housing facilities are calculated by the use of the factors of area and *time*.

The expenses incident to the equipment investment, e. g. depreciation, insurance, interest and taxes, are all related to *time*. The amount of investment and the element of *time* are the important factors.

The expenses of the power plant, or for purchased mechanical energy are related to *time*. Horsepower required for operating the machines and the time of operation provide the means of determining the proportions of power expense chargeable to processing divisions.

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The superintendent supervises the active *time* of productive processes, while the foremen supervise the *time* of the individual employes whether classed as productive or nonproductive.

Water, soap, towels, and toilet facilities are required for the convenience of every individual, during the *time* that he is in the factory or office. These items are related to personal *time*.

Supplies consumed in the operation of the processes are required practically in proportion to the active operating *time*.

Records of the activities of manufacturing processes and individuals require the use of supplies relatively in the proportions of the active *time* of the processes. Activity, not idleness, creates the necessity for the expenses of such supplies and the services of time-recording and cost-computing clerks.

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The normal unit of *time* measurement is the *hour*.

The logical unit of process measurement is the *process hour*.

The cost of process hours will vary with the expense elements involved and the number of process hours over which the process expenses must be averaged to get the average cost of the process hour.

The cost of a process hour is a complete cost. Every element involved in the process having been included, there is nothing to add or subtract.

The total of the expenses involved in a given process during a given period of time, divided by the chargeable (revenue producing) hours of that process actually charged against the production orders during the same period, determines the rate at which such hours must be charged to determine the cost of that process as applied to the order.

It follows that the total charges against all production orders during a given period must practically balance with the total of the expenditures of the same period. (These totals are almost invariably within one-quarter of one per cent of an exact balance.)

Wages may or may not be included in the process hour cost rate, at the choice of the engineer.

Wages comprise simply one element in cost.

Wages have no relation to the total of the process hour cost.

Wages are always related to *time*. They are computed on the basis of time worked, or pieces processed or assembled. Piecework rates are set on a time basis.

Where no special reason exists for a separate consideration of wages they should always be included as one of the elements of the process hour cost. Inclusion within the hour

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rate materially reduces the clerical effort required for the operation of the cost system.

In replacing a cost accounting system, by the planning and installation of a Cost Engineering system, it is usual to find that the clerical effort is lessened.

Cost Engineering corrects all of the inaccuracies of cost accounting.

In Cost Engineering there is no "overhead expense." All expense elements are definite.

Cost Engineering is analytical. It analyzes and particularizes where cost accounting amalgamates and generalizes.

Cost Engineering is practical while cost accounting is theoretical.

"Business will not be on a sound economic basis until prices rise and fall with costs.

"The word 'fair' in connection with prices lacks virility; it not only admits but invites debate; it suggests possibilities of variations.

"A fair price is a right price, and the right price depends upon conditions that are susceptible to scientific investigation.

"Price is fundamentally a scientific proposition.

"As the problem of cost, which is of first and fundamental importance, is worked out, the question of price naturally follows.

"Whether a man shall be permitted to add little or much to his cost by way of profit, one thing is certain, the right price never falls below cost."

—Arthur Jerome Eddy.

CHAPTER IV

GETTING THE COST OF THE LOT, OR ORDER

The cost of the order, whether it specifies a single article, as a machine, or a lot of identical articles, is the chief objective of Cost Engineering effort.

The cost of the order includes the expenditures for materials, the expenses of merchandising insofar as they apply to the materials specified; the cost of the process units required; and, if the order is for articles already sold, it should include the expenses of selling.

Because the plan of the system must conform to the particular conditions that exist in the individual factory for which it is designed, it is impractical to present the forms of a system in this chapter. An outline of general features however may be of practical use.

There are five steps in the operation of a Cost Engineering system:

1. Making the initial records of materials and process time.

2. Recording chargeable and non-chargeable time of processes.

3. Assembling the records of materials and process time applied to individual production orders.

4. Distribution and summarization of operating and selling expenses.

5. Calculating the order cost.

The first three of these steps are daily routine. The first is accomplished by the persons in charge of material stocks, and those in direct charge of processing units. The second and third are included in the duties of the cost clerk.

The fourth step is taken monthly, and is usually included in the duties of the accountant. The time for this distribution and summarization is immediately after the completion of the trial balance of the regular accounting system in use.

The fifth step is taken immediately

after finishing the processes of the production order. The cost of each order or lot should be known not later than the day following the completion of the work, so that if necessary, or advisable, billing may be done on the basis of known cost.

In making records of materials chargeable to orders a requisition system will be found advantageous. This provides a double check on the materials, as one person makes a record to which another attaches his signature or initials, in confirmation of the receipt of the specified items.

Records of process time (not wages) are made by the persons in charge of active processing units. The time report carries the data necessary regarding date, machine, operator, time of operation, quantity output, or other items as the conditions demand.

The record of chargeable and non-chargeable time, made daily and closed up monthly, provides valuable

data for the management, as well as developing the number of process hours to which the process expenses are chargeable.

The assembling of records of materials and time applied to individual production orders, is part of the duty of the cost clerk. In fact, this is the chief duty of that individual. It is usually found advisable to transcribe the items from the reports of the operatives to the order cost memorandum, a special form of record, designed in every case to meet the requirements of the factory in which the records are made. Other methods of assembling this data may be used where there is special reason therefor.

The author feels that at this point he should warn the reader against a possible misunderstanding.

To clearly grasp an outline of Cost Engineering methods the subject should be approached with an

open mind, as free as possible from the ideas that have been developed through more or less familiarity with cost accounting methods.

The reader must not assume that because the procedure of getting initial data is similar to that frequently used by cost accountants, it follows that the data is to be treated in the same way. Keeping his mind open for the purpose of getting the proper perspective of the subject he will be better able to grasp fully the ideas which the author intends to present.

The distribution and summarization of the operating and selling expense is the vital part of the Cost Engineering system. For the accomplishment of this there are certain definite fundamental principles that must be thoroughly understood and rigidly followed.

The user of the cost system must not permit himself to be influenced by a desire to have the results con-

form to his own impression of what they should be.

He must remember that a cost system is not a price-making system. Cost is a fact, the definite sum of certain definite expense factors. The cost system is simply the plan and means by which the expense factors are determined and charged. Selling prices are purely arbitrary, and while a cost system serves as a guide for making profitable selling prices, the cost is to be honestly determined on the basis of facts. The cost remains the same regardless of price. Giving the product away has no influence on the cost.

Each expense element must be so applied that each process will be charged with the proportion which, by measurement, represents the proportion of the advantage or benefit accruing from the expenditure.

That this may be properly accomplished the accountant should be thoroughly instructed by a compe-

tent and experienced cost engineer.

Too many accountants, because of the latitude permitted in cost accounting practice, think that they are competent to pass judgment as to where certain expenses should be applied. A desire to please the "boss" by making unprofitable items appear profitable, adds to the temptation. Even the boss himself sometimes yields to the temptation to hide inefficiencies by influencing the results.

Any deviation from the positive application of principles and rules is bound to be reflected in the results. One cent per unit improperly applied in the summarization destroys the accuracy of the result. Where a cent is omitted the goods may be priced too low, attracting sales at a loss of normal profits. The amount of expense being definite in total the omission at one point places an added burden at another, with the result of hindering sales of profitable business.

The manufacturer may give away his product, or his profits, and enjoy the reward of the philanthropist, but if he juggles the figures of his cost system, he is on a par with the man who arbitrarily changes the figures in a mathematical problem, and proclaims himself a fool.

Finally, with records of items of materials charged to production orders at cost (not purchase price, for cost includes the expenses involved in transportation, investment and handling merchandise); with the definite time of factory processes charged at definite, proven cost rates; and with the expenses of selling included where goods are already sold, the total cost of the production order is found by simply adding together the items involved.

There is nothing to add to the cost except profit. There is no mysterious "overhead burden," no element of "a percentage for contingencies."

Cost found under the Cost Engineering methods provides for the replacement of equipment worn out in the service of the customers. It provides for replacements made necessary by new inventions and the inutility of machines, caused by changes in the character of the output. It provides, before profit is calculated, for payment to the stockholders, of interest on the money borrowed from them for the conduct of the business, the evidence of which is the stock certificate.

Cost Engineering in its entirety is a symmetrical structure, balanced in every part. It requires the reader to take nothing for granted, but demands proof at every step. Its findings will prove as accurate as the work of the persons entrusted with its operation. Cost Engineering has made costfinding practically an exact science.

The source of knowledge is experience.

Experience is of two kinds—our own, and that of others.

Knowledge gained from our own experience is most expensive, that gained from others most economical.

Stupidity is still the big factor in retarding the progress of the human race.

Study! Reason! Act!

CHAPTER V

COST RECORDS AS A BASIS FOR ESTIMATING

In the preceding chapters the reader has been shown the necessity for discarding old and adopting new methods; a comparison of the cost accounting fallacy with cost engineering practicability; how all expense factors are related to the time element, and the modus operandi of Cost Engineering.

He has been shown that cost is the result of conditions and can be influenced only by changing conditions, not by schemes of figuring; that when production of an item is once accomplished, no influence under the sun can change the amount of its cost.

We have no means of knowing the future except by predicting its probabilities upon the past. We know that records of the past are safer than

recollections of the past; that compilations of recorded data are a safer guide than confused mental impressions and their resultant conclusions; that while the man who has suffered or lost through moral or economic weaknesses in the past may feel sure that he will do radically different in the future, experience proves that actual changes are slow. In a factory organization which has become inefficient through lax methods, the change is slower. One man may make a strong resolve to change his habits and develop a noticeable change at once. But an effort to synchronize a hundred minds so that they will act in unison, in a manner different from their custom, is a slow and laborious task.

These things being true, records being used to prove their truth, we find it safe to assume that a body of people engaged in the manufacture of definite items of product will,

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under the same conditions of equipment and supervision, work next week at the same rates of speed as they worked last week; next month they will produce as much in the same hours as they did last month. The average rate of production per hour for one period of six months, or a year, will be about the same as for another.

Now, if records are kept continuously, and the average for twelve months used for one month; and at its close, the new month's record added, dropping off the twelfth month preceding; thus making a new average, eleven-twelfths of the data being the same as in the previously used average, there can be little change in result. The only influence for change will be the difference between the data of the month added and that of the month omitted.

Output records will show even less variations. Machines are driven by

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the same power, at the same speed, throughout busy seasons, and dull.

If, then, we have known rates of output per hour for the various processes, under the circumstances and conditions which prevail in a given factory; and also have known cost per hour of operation of the same processes; we have unquestionably the safest possible basis for predicting, or estimating, future performance and costs.

It is not safe for one factory to use the records of another factory in making estimates. The "atmosphere" in different factories varies greatly. One factory is managed by an apathetic management and work moves slowly. Every employe feels the influence of lethargy and attunes himself to the slow time of the institution. In another factory, everything moves by schedules. They are set with the purpose of accomplishing results in minimum time. There is in

this case very little lost motion. The employe never has to ask for orders. They are planned for in advance.

It would be ridiculous for one of these factories to use either the production records or the cost rates of another. Slow time usually means low hourly rates of cost, with high production cost, because comparatively few pieces are finished in the hour. Rapid production, on the other hand, will probably influence hourly rates so that they will seem high, yet production costs are likely to be lower than in the other case.

It follows that the estimates of cost should, whenever possible, be made upon the basis of carefully kept records of the performances of machines and people in the factory producing the articles.

Under ordinary conditions no two men make estimates that will stand comparison. Estimates in the ordi-

nary sense are purely advance guesses, as to how much it will cost to produce a certain number of items of given specifications.

More or less data are used by some estimators. Others make an out and out guess as to the price that should be charged, without measurements or calculations. Some of these people (and they are usually men whose work is not checked for errors or losses) boast that they can tell within one per cent of what it will cost to make any article within the scope of the processes the factory is equipped to perform.

As a rule these people stop estimating as soon as a cost system has been installed. They do not agree with the findings of the system. Whenever they can, they either prevent or delay the installation of the system. It is only natural that they should not like to have their guesses tested by a mechanically perfect

system. It is apt to injure their "prestige."

With a Cost Engineering System such as has been already described, and with complete production records from the factory divisions, the element of guesswork is very largely eliminated from the estimate.

However much we may like to think otherwise, it is unquestionably true that the only safe measure of the output of any process is the average for the factory or division. We like to think that we have highly efficient people. We may have them, but their effect is only to raise the average. The fact remains that the average output is the measure of capacity.

Estimating is pricemaking. Pricemaking is one of the most important functions of management. The profitableness or unprofitableness of the business hinges largely upon the selling prices being high enough to

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yield a satisfactory profit. Not too high, lest the business be driven to the competitor. There is a point which insures fairness to all.

The cost system provides the data for estimates which will be fair, and, when the product has been made, serve as a test of the correctness of the work of the estimator.

CHAPTER VI

AUXILIARIES OF THE COST SYSTEM

Two important features that, while not strictly designed for costfinding purposes, are recommended as auxiliaries to the Cost Engineering system, are the Perpetual Inventories, and Machine Records.

These features are established simultaneously with the cost system, without additional fees, whenever the client is willing to authorize the expenditures for supplies and operation.

There are many manufacturers who have not yet admitted the value of the perpetual inventory of merchandise, including both raw materials and finished product.

Few manufacturers would place any considerable sum of money in a common cash drawer, and give a key to each of his employes, on the tacit

understanding that he should use it only in the interest of the employer.

Yet, a large proportion of manufacturers will, and do, unhesitatingly invest thousands of dollars in materials and merchandise, which is stored in open places, easily accessible to every employe, without even appointing a custodian whose duty it is to safeguard the investment.

The manufacturer may have absolute confidence in the honesty of his employes. They may be as honest as he is, but under such conditions he places before them the temptation to help themselves to items that they would otherwise have to purchase.

Little leakages may seem unimportant, but the habit of pilfering grows when no effort is made to check it, and the confidence of the employer in his employes may become a curse to them and a source of great loss to himself. The perpetual inventory and requisition system are

comparable to the bank account and check book.

The perpetual inventory does more than stop shrinkages. Properly conducted it will prevent shortages, overstocking, and encourage a disposition on the part of employes to recognize value in material which otherwise is frequently handled without consideration of the investment involved.

If the owner and employer does not place a value on his own property it is not likely that his employes will do better than he.

The Machine Record is useful for making comparisons of the performances of various processing units of the same character. It provides records of output for the guidance of the estimator. It shows the relation between output and capacity. The clerical effort required to keep it up to date is almost negligible.

The man who has never used a cost system, with its auxiliary records,

cannot appreciate how valuable they may be. The author believes that hesitation to adopt such systems is generally due to either a disinclination to apply one's self to the task of learning and practicing new methods, or to the fear that admitting that one has something to learn is an admission of weakness.

We are creatures of habit. After we have drilled our minds to follow certain lines of thought we get into mental ruts. If one is inclined to mental laziness the effort to getting out of the rut and breaking a new channel for his thought current is distasteful.

The man who would prefer to work in the dark, rather than in the light, would be considered a subject for a lunacy commission, yet there are hundreds of men in this country who pose as business men, who decline to adopt advanced measures in the face of the indisputable evidence pre-

sented by those who have learned the advantages of their adoption. The excuses they offer are frequently ridiculous. One says:

“The conditions in my factory are so peculiar that it is impossible to find the cost of the product. My own judgment is my cost system.”

Such a statement has about as much foundation as the claim that the rules of multiplication would not apply to $2 \times 4 \times 15$ exactly as well as to $9 \times 9 \times 9$ because the factors were different. A cost system that depends upon the judgment, the presence, or the health of a single individual, is unsafe. Another says:

“My product must be sold at prices which are already established by my competitors, so the cost system would be useless to me.”

This is sheer shortsightedness. In very few industries are prices established. There can be no established price in industries whose product is

made to the specifications of the customer. Unprofitable prices are always subject to change. The proof offered by a practical cost system provides the best possible argument in advancing prices, as well as a means of convincing competitors that changes are necessary. A third says:

“My old method of cost accounting is satisfactory because it always shows a profit at the end of the year.”

This quotation means nothing to the man who knows that profit and loss statements are notorious for their omissions of economic expenses. Hundreds of concerns that are losing money are able to present a statement showing a profitable period by arbitrarily disregarding the elements of depreciation, interest on investment, and not infrequently the item of rent.

It is easy by such methods to hide a loss of ten per cent of the invested capital per year, and often more. On the basis of a ten per cent loss the

concern would not be insolvent for ten years. Insolvency is usually covered up for a period after it occurs, and the bankrupt concern will usually show liabilities exceeding its assets by fifty per cent. A business whose accounting system is so handled can lose ten per cent per year for fifteen years and fail, without the management knowing the true cause.

Accounting literature is so full of theories and personal opinions, lacking the support of fundamental principles, that the accountant responsible for the conditions in such cases can probably cite an "authority" for every move that he has made.

The establishing of a thorough Cost Engineering system, based upon definite fundamentals, and buttressed by the auxiliaries of perpetual inventory, requisition system, and machine records, affords the strongest safeguards against losses of all kinds.

“The greatest present need is an antidote for the unwillingness of men to profit by the previous experience of others. It would be amusing, were it not so expensive, to watch the gropings of many corporation officers for methods to test efficiency. Ignorant of fundamental principles, intolerant of outside suggestions, unable to detect the analogy in other undertakings, they repeat the expensive experiments of the past.” —Charles DeLano Hine.

CHAPTER VII

SYSTEM AND RED TAPE

System in business is of comparatively recent origin. In fact if one is to judge by the evidences that have survived a century he will find that orderliness has become a subject for consideration almost within the memory of men now living.

Look at the map of any old city, even on this continent, and you will find in the irregularity of the streets evidences of lack of system, or plan, on the part of the mentalities responsible for their arrangement.

A lack of orderliness is characteristic of practically all of the activities of humanity a hundred years ago. Any man in middle age can recall numerous instances where radical steps have been taken to end the confusion and disorderliness of rule of thumb methods.

Street numbering systems have

been changed in many of the large cities within the memory of school children. Standardization of time is a development of recent years, brought about by the necessities of rapid transportation schedules.

A few cities cling to their old unsystematic methods of numbering streets. A few stubborn obstructionists still refer to sun time as "God's time." A few business houses still use single entry records of business transactions. A few still keep their accounts on spindles or hooks where the gentle zephyrs of Summer can blow them out of the window and clean the slate for delinquent debtors.

These, and their ilk, are responsible for much of the prejudice that exists against modernization of business, for the characterization of all systematic effort as "red tape." Only the unthinking, however, listen and lose.

The cash register, the credit register, the adding machine, the mechan-

ical calculator, and the cost system have come to stay. The systematic business is the progressive, growing, profitable business today.

If you have occasion to visit two factories, and find one of them housed in a dark, dingy building, the yard about it strewn with scrap and junk, the manager's desk cluttered with a jumble of correspondence; and the other housed in a modern, well-lighted building, with a grass plot in front, a yard free from scrap, an orderly, well-furnished office, a complete filing system making it possible for the manager to place his hand on any paper required without delay, while his own desk is free from all papers except such of the current day's work as he still has in hand, which would you say was the most desirable?

If you were to approach the manager of the disorderly factory with a proposition which would help him to bring order out of chaos, which

would enable him to greatly increase the profitableness of his business, while at the same time relieving him of much of the detail and confusion of his daily work, he would probably respond by telling you that thread-bare story about the factory that was so busy trying to keep up an elaborate system that its personnel had no time to make product.

If you were to refer to the conditions in the more systematically conducted factory, he would probably tell you that his prosperous competitor was a flagrant "price-cutter," whose only aim in life was to destroy competition. You would however know the truth: that systematic methods are economical methods; that disorderly methods cost more than all the modern equipment required in any business.

No doubt some factories have been over-systematized. Some people go to extremes in everything, and every-

body goes to extremes in some things. But cases of over-systematizing are not nearly so numerous as the stories would indicate.

For one factory that loses by too much system there are a thousand that lose by too little. Even an inefficient system is better than none. It is a mistaken idea to assume that because somebody overdid a thing, that that thing should be avoided. People die from overeating as well as from starvation, but neither discourages the sensible man from the use of a normal amount of food.

If a business is to be successful it must have system. The better the system the greater the probability of success. How could a railroad be operated without system? How could any organization succeed without system?

System is simply a set of laws or rules governing actions. System is the well-planned, smooth-working,

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clearly-defined track which directs applied energy toward the goal of efficiency.

He is an unthinking man who confuses system and "red tape." Red tape is useless system—the curves and grades that consume energy out of proportion to the result obtained.

The competent engineer makes a careful survey, and knowing definitely the desired end, maps out the route which will get the result with the least effort. The first cost of a good system may be greater, but it will prove more economical, and profitable in operation.

Denham systems admit no red tape. They are built to get definite and essential information. They succeed because, to our engineers, costfinding is an exact science. They know by special training and experience what information is essential, and how to obtain it, by the most direct methods.

There is no magic formula that will find the cost in all cases. There is only the plain facts that the expenses of manufacture are definite, in amount, in purpose, and in benefit. Product and the operations of production must be analyzed to determine the elements and proportions of the elements of which they are composed.

Expenses must be analyzed, to determine their amount, their purpose, and the proportions in which the operations or items of production are benefited by each expenditure. Then each must be applied to the proper item in the exact proportions. Only thus can correct results be obtained.

All of this is governed by certain fixed and fundamental principles which, although until recently unrecognized in cost determination, are as old as justice itself. When the rules and principles are known, the

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results are as definite and provable as mathematics. They are mysterious only as the unknown is mysterious to the ignorant. All things are simple when known. The better known they are the simpler they appear.

Now, Mr. Manufacturer, isn't it a fact that your fear of red tape, your excuse for not adopting systems, is not so much a disbelief in the use of system as it is a disinclination to apply yourself to the study of new methods, so that you may adopt that system which will most efficiently serve your requirements; and, further, to the fear that the system will show you so many weaknesses in your present methods that you will be forced to change your habits of thought and action?

Mental laziness and ignorance are at the bottom of most failures. Mental laziness begets ignorance; ignorance begets fear; fear begets

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inaction, and inaction begets decadence; the result is failure.

Knowledge of your business comes through a careful analysis of records of production and expense. Face the issue squarely. Know, then act. System properly applied is the best source of knowledge for the manufacturer.

Too much censorship over individuality reduces it to mediocrity, and this is especially true when a brilliant thought or suggestion is passed upon by a number.

If the idea is slightly modified by each, it becomes commonplace, weak and conventional, and is doomed to blend with the great mass of the ordinary.

—In Office.

CHAPTER VIII

**THE COMMITTEE-MADE "UNIFORM
COST SYSTEM" AND THE COM-
MERCIAL COST ENGINEERING
SERVICE**

Within the past few years there has been a great awakening in a number of industries to the importance of knowing the cost of production.

The Federal Trade Commission, under the able chairmanship of Mr. Edward N. Hurley, has done much to arouse interest and action in the direction of co-operation among competitors in the effort to establish uniform methods.

Mr. Hurley's effort was intended to encourage the adoption between competitors, for their own advantage, and the government as an interested spectator, a common language of business. He realized that the lack of a definite terminology of business was a serious drawback.

Every man placed his own interpretation on such words as "cost," "expense," "profit," etc. There was no common agreement, therefore reports and financial statements lacked the uniformity of method that made them intelligible, at least in the absence of the maker.

Mr. Hurley in his book "The Awakening of Business," says: "Men go into business to make money. Profit is the difference between cost and selling price. Goods cannot be properly priced unless the cost is known. The lack of an adequate cost system in a factory is like the lack of a compass on a ship. It makes it impossible to direct business intelligently and scientifically. At the present time it is estimated that ninety per cent of the manufacturers of the United States are pricing their goods arbitrarily; either upon a basis which will get rid of the goods as soon as they have been

manufactured or upon the basis of what their competitors are charging. While it is true that supply and demand are the determining factors in the price of any particular goods once they are placed on the market, cost is the fundamental factor to which every manufacturer who expects to remain permanently in business must return as the only sound basis upon which to figure his prices.

“The inadequacy of cost accounting systems in American factories is astonishing. Many of these systems are worse than none at all because they are misleading. Some have been built up in the manufacturer’s own office and applied by a bookkeeper who is not familiar with the principles which underlie cost accounting. Others have been designed by cost accountants who knew their business but who were so handicapped by the instructions of the manufacturer that they could not do

justice to themselves or to their client. * * * *

“Every article produced should bear its equitable share of all expenses, including overhead and selling expenses. There are manufacturers whose line consists of, say, six articles; on three they are making a profit and on three they are losing money, but claim that these three articles help to take care of the overhead expense. This method of doing business is most detrimental to healthy business conditions. Frequently one of these articles may be the sole product of an individual who is striving and struggling to exist against a firm which is placing the same article on the market as a means to help take care of its overhead expense. Surely this is not wholesome competition. An adequate cost system would reveal this unhealthy condition and make a remedy possible.”

Mr. Hurley has gotten the right perspective of the situation in connection with the worst phase of American business. He realizes the inadequacy of cost accounting methods. If he were to take the time and thought necessary to familiarize himself with the distinctions between cost accounting and Cost Engineering, contrasting the arbitrary formulas and uncertain practices of cost accountants with the fundamental principles upon which Cost Engineering is based, his approval would without doubt be given to the latter.

At any rate the big work that Mr. Hurley has done in the matter of stirring the American manufacturers to a realization of the need for better costfinding methods is fully appreciated. It is to be regretted that Mr. Hurley could not have remained in the position so vital to the welfare of American industries.

Mr. Hurley wanted uniform meth-

ods of costfinding adopted by manufacturers, particularly in the same line, so that comparisons could readily be made. He referred to this as "uniform cost systems." He knew what he wanted, but again the uncertainty of terminology in cost accounting caused misunderstanding. The majority of manufacturers have a wrong idea of what constitutes a cost system. It is commonly supposed to mean a collection of forms, ruled and printed alike for the use of all.

The "uniform cost system" as Mr. Hurley intended it to be understood was not a collection of forms identical in design, but a uniform usage of definite teachable fundamental principles such as form the basis of our mathematical system. To expect all manufacturers to use the same form of records in their factories would be as foolish as to expect that all mathematical problems could be worked

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out in exactly the same arrangement of figures. It is a strong indictment against the knowledge of the subject, on the part of the average manufacturer, to note the official action that has been taken by many organizations toward the appointment of committees to design "uniform cost systems." At the same time it is highly complimentary to their spirit of progressive action to note how promptly they took hold of Mr. Hurley's suggestion, as they understood it.

Committees were appointed by many organizations of manufacturers and some of them have made reports, offering so-called "cost systems," which in some cases have been adopted by the body, and recommended for installation. Few of them have any real merit.

The home-made cost system is generally a rank and expensive failure, because its author has neither knowledge of fundamental principles

nor practical training in their application. The committee-made cost system suffers from the same cause, frequently more, because there is always opportunity for the individual committeeman to shift the responsibility for failure to the shoulders of other members. Not infrequently, the most ignorant members of the craft are placed upon the cost committee in the hope that it will stimulate them to study. The successful members usually take the attitude that they are all right, but that it is their duty to prepare a strong dose for the other fellow.

The average business man or manufacturer has an inborn dislike for the drudgery of delving into details. It seems to him a needless expenditure of energy. He prefers to accept superficial generalities rather than try to assimilate accurate, but detailed, presentations of the facts of his business.

When an organization appoints a

committee and commissions it with the work of devising and recommending a system for cost-finding, it cannot eliminate from the make-up of that committee the disinclination on the part of its members to drudgery that has no direct returns, and their willingness to adopt the impractical, in order that they may present a report which will indicate that the committee has not been idle.

The members of the committee, being at sea as to what constitutes real cost-finding, have a vague idea that somehow or other there ought to be a means by which records of product and expenses are gotten together, so that expense is applied to product. As a rule they console themselves with the oft-repeated though erroneous statement that "any method used is necessarily arbitrary," and consequently it requires simply an agreement upon some one method, and all will be well.

Inasmuch as none of the members of the committee have practical knowledge of the principles of Cost Engineering there is no means of proving that their conclusions are either right or wrong, and the so-called "system" is readily adopted.

Rarely, if ever, does a cost committee really devise either methods or forms. It usually meets about a table to consider a hodge-podge of printed forms and data collected from many sources, and undertakes to piece together a group of unrelated forms and methods. Often some member with a pet hobby insists upon the inclusion of his idea as a compromise before he will agree with the rest as to the complete report. The committee having agreed, presents its report to the organization.

The fact that the members of the organization are not better informed as to principles than was the committee, renders it unlikely that there

will be any serious objection to adopting and recommending the system. The situation is not unlike the instance of a little girl who, when making strange marks on a piece of paper, was asked by her mother as to their purpose. She said, "I am writing a letter to Lillie Smith." "But, my dear," laughed the mother, "you don't know how to write." "O, that doesn't matter, mother," she replied, "Lillie doesn't know how to read."

It is unfortunate for manufacturers that their committees are so ready to offer them impractical methods, for the organization, generally, has faith in its committee, and backs it up by its unqualified endorsement, and the laymen then assume that the work has been properly done, not only giving it full credit, but discrediting and opposing anyone who differs with the conclusions of the committee, or the recommendations of the organization.

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Years afterwards, when the truth becomes known, the craft which is involved discovers that it has wasted a great deal of time and money before it learned the truth.

On the other hand, a commercially exploited cost-finding service is compelled, in order to succeed, to deliver the goods. Failure on its part would very soon put its promoters out of business. It simply becomes a case where, when a contract has been made, the contractor must make good or suffer the ignominy of failure. No such incentive to careful and accurate work pushes the organization committee system to a successful conclusion.

It is not unreasonable to assume that specialists who have devoted years to intensive study and development of the science of Cost Engineering are better qualified to accomplish dependable results than committees of men whose knowledge of the sub-

ject is less practical, however competent or successful they may be in their particular callings.

To those organizations which are interested in a movement for determining cost of production in their particular field, the author suggests that they appoint committees, not to devise cost systems, but to investigate the merits of the various methods already in use, and instead of undertaking to accomplish results by taking the work in their own hands foster the competitive development of cost-finding methods without expense to their organization, through demanding the best possible methods which can be devised and installed by commercial concerns.

To such committees is offered freely every available means of investigating the merits of Denham Cost Engineering Service and comparing it with any other which may be available.

A vicious cause of inefficiency is indifference to the necessity for proper equipment. A director who would not think of demanding that his workmen produce machine product without first providing machines, will thoughtlessly demand efficient results from a manager while refusing to authorize the installation of a modern Cost Engineering system. The cost system is simply managerial equipment, without which the manager's efforts are minimized.

CHAPTER IX

SEVENTEEN REASONS WHY DENHAM COST ENGINEERING SYS- TEMS ARE SUPERIOR TO ALL OTHERS

1. Because Denham systems are accurate, comprehensive, elastic, simple, logical, provable, satisfactory and permanent.

2. Because Denham systems embrace the solution of the problem of distributing the so-called "overhead" or indirect expenses of manufacture. No other method does this.

3. Because Denham systems do not depend upon personal opinions or theories, but are the result of the intelligent application of definitely known principles, as fundamental as the law of gravitation.

4. Because with a Denham system one customer or item cannot possibly be charged with a cent of expense properly chargeable to another. Nor

can a cent be omitted. Justice is its keynote.

5. Because Denham systems are the result of applying common sense to the cost problem. No other methods will stand the test of logical analysis.

6. Because Denham systems are the result of many years of specialized study and experience in the scientific application of individual expenses through individual productive operations to individual items of product. No other systems approach them in either accuracy or simplicity.

7. Because in an analytical comparison of Denham systems with the ordinary type of "prime cost and overhead" or percentage system the latter is proven to be ridiculous in practice, and its use due to either ignorance or indifference.

8. Because through Denham systems cost can be determined in a

provable manner with less clerical effort than is usually required to operate the inferior misleading systems.

9. Because Denham systems are installed by engineers who are first selected because of their intimate knowledge of and thorough experience with factory operations and problems; and then trained carefully in the application and teaching of the fundamental principles of cost-finding.

10. Because by solving conclusively the problem of expense distribution, costfinding has become practically an exact science. Denham systems leave no opportunity for doubt as to accuracy.

11. Because the Denham Cost-finding Company backs up its service to the limit. Not only making a complete and efficient installation, but keeping in touch with its clients so that new problems are easily and correctly solved.

12. Because since the introduction of labor-saving and power-operated machines have rendered untenable the theory that an "overhead burden" can be distributed upon the basis of either direct wages or an hourly machine burden rate, Denham systems offer the only logical means of determining cost of production.

13. Because the "overhead account" being the manifestation of ignorance, has no place in modern costfinding. Denham systems have no overhead account because Denham cost engineers understand and apply the principles of expense distribution.

14. Because satisfaction with Denham systems is greatest when best understood, while with percentage systems, analysis and reasoning are bound to destroy confidence.

15. Because Denham systems are the only systems which meet every requirement of modern manufactur-

ing conditions. No other system will determine accurate cost where a variety of product is produced with varying proportions of widely different processes, and a constantly fluctuating state of trade.

16. Because Denham systems, by pointing out and making easy the elimination of waste and losses, prove the greatest source of profits in the business, often putting a formerly unprofitable business upon a sound and profitable basis.

17. Because Denham systems fully meet every claim of The Denham Costfinding Company. Denham systems make good.

Denham Cost Engineering systems are not ready-made systems. Every Denham system is a made-to-order system, designed for the particular factory in which it is installed.

The outlay for installation of a Cost Engineering system is of small importance compared to the greater profits that will result from its practical use.

The best is always the most economical.

CHAPTER X

INFORMATION ABOUT DENHAM COST ENGINEERING SERVICE

Denham Cost Engineering Service was established in 1908. Installing organizations, under district managers, are maintained at Cleveland, Philadelphia and Chicago. All contracts for service are made with The Denham Costfinding Company, (Ohio) at Cleveland.

Extent of Service

Installations have been made in approximately seven hundred factories. The territory served includes all of the industrial states within the United States, and extends into Canada. Concerns operating under Denham Systems are located in over one hundred cities, from Boston to San Francisco.

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Lines of Manufacture Served

Account Registers	Galvanized Pails and Tubs
Advertising Novelties	Gas Ranges
Aluminum Ware	Generators
Automobile Mountings	Gloves
Automobile Tires	Hardware
Baling Machines	Iron Foundries
Bank Notes	Ironing Boards
Bank Supplies	Ice Machines
Blank Books	Jewelry Cases
Book Binderies	Kitchen Equipment
Brass Foundries	Knit Goods
Brass Goods	Leather Gloves
Calendars	Leather Mittens
Chaplets	Lithographs
Churns	Loose Leaf Devices
Cigar Boxes	Machine Composition
Cigar Box Labels	Machinery, Baling
Clothing	Machinery, Lock Corner Box
Color Plate Engraving	Machinery, Electric
Cooking Utensils	Machinery, Ice
Corrugated Containers	Machinery, Malting
Corsets	Machinery, Optical
Cotton Gloves	Machinery, Pharma- ceutical
Cutlery	Machinery, Printing
Display Cases	Machinery, Transmis- sion
Drug Labels	Manifold Books
Enameled Kitchen Ware	Metal Scrap Balers
Envelopes	Milk Cans
Electric Cut-out Boxes	Mittens
Electric Dynamos	Munitions
Electric Equipment	Nickel Plating
Electric Signs	Office Supplies
Fibre Shipping Cases	
Fireless Cookers	
Folding Boxes	
Fruit Jar Rings	

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Optical Goods	Steam Cookers
Paper Bags	Steel and Copper Plate
Paper Boxes	Engraving
Paper Cans	Steel and Copper Plate
Paper Tubes	Printing
Paper, Toilet	Steel Furniture
Paper, Waxed	Steel Ranges
Photo Albums	Step Ladders
Photo Engravings	Stoves
Pins	Surveying Instruments
Piston Rings	Toilet Paper
Printing	Tools
Printing Presses	Tractors
Publishers	Transmission Machinery
Rubber Goods	Varnish
Rubber Jar Rings	Varnish Stains
Rubber Tires	Wax Paper
Sales Books	Wind Shields
Spectacles	Wire
Stampings	Wire Screen Cloth
Stationery	Woodenware

Period of Service

The period through which Cost Engineering Service is required varies from three months in small factories to six months or more in large factories, depending upon the problems presented by the individual cases, the class of help employed, and the degree of co-operation given to the engineers doing the work.

The term, as expressed in months, does not mean either that the service is limited to that time according to the calendar, or that the engineer devotes his time exclusively to that contract for the period. For example:

In the case of a three months installation period, the system is to be operated for three months under the supervision of our engineer. The period of planning, preceding the actual operation; and the time required to complete the summarization of the records and expenses for the third month, after the close of the third month's records, necessitates a total period of approximately fifteen weeks. A four, five, or six months installation will require relatively longer preliminary and completion periods, so that the actual time from beginning the plan to the finished records, on a six months' contract will be approximately seven months.

The engineer's presence is not required constantly for the full time. He is permitted to use his discretion as to the time when he shall be present, but the Company guarantees that the service shall be efficient, and the system installed shall be both practical and complete.

Fees for Service

A personal inspection of the factory is necessary before a definite quotation can be made. The total fee is always specified in the contract. We do not make installations at per diem rates. The Company guarantees complete and practical systems efficiently installed for the fee stipulated.

This plan safeguards the client as well as the standing of the service. We cannot, by slowing up, increase the expense of installation, nor can the client through a mistaken impression, or false economy, stop the in-

Installation in the belief that his partially trained employes can complete the service alone. Such action could only result in failure and dissatisfaction detrimental to both.

A guaranteed service at a stipulated fee is the only practicable plan for this type of service. Experience has proven it most satisfactory in the seven hundred cases which we have served.

How To Get Service

Write to The Denham Costfinding Company, Cleveland, Ohio, asking them to have a representative call upon you. This call does not obligate you to engage the service unless you are convinced that it will prove profitable.

The representative, either a district manager or the chief engineer, will visit you, look over your factory, discuss with you the methods of

doing the work, explain what will be required on your part, and make you a quotation.

Give him your order. The service will be started at whatever time you wish it, unless previous orders cause delay, in which case it will be given its turn.

Character of Service

Have no fear as to the character of the service. The men we employ are high-class engineers, not accountants or bookkeepers. They are men of large experience in factory work and specially trained in Cost Engineering. They are absolutely trustworthy. Their position is strictly confidential. You need not hesitate to discuss the most vital conditions in your business with them.

We offer every facility for your convenience in investigating the merit of this service. If you are using a cost accounting system, a home-

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made system, or have none, it will pay you in largely increased profits to avail yourself of this offer.

No Financial Obligation Unless You Order

Remember, we will send a representative to any point within the range of our installing organizations, upon the request of an executive of any factory employing fifty or more people. (In certain localities we can handle smaller cases.) There is no obligation involved, except to give our representative a prompt hearing and our proposition earnest consideration. Write today.

**THE DENHAM COSTFINDING Co.
Cleveland, Ohio**

**THE DENHAM COSTFINDING Co.,
CLEVELAND, OHIO**

Please have your representative call on us to discuss the value of a Cost Engineering System in connection with the operation of our business.

This request involves no obligation except to give him an interview promptly and to seriously consider the advantage of your proposition.

Time of call preferred

Very truly yours,

.....

Official Title.....

Should be signed by General Manager or Corporation officer.

COST ENGINEERING SERVICE

The Denham Costfinding Co. of Cleveland, Ohio, provides Cost Engineering Service for the planning and installation of Cost Engineering Systems in Factories. Six hundred users in over one hundred cities of the United States and Canada attest the practicability and profitableness of the service. A representative will be sent on request.

“ “ “

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COST ENGINEERS

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